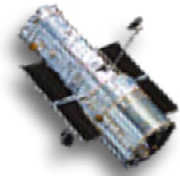


Hubble Facts

HST Program Office

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Hubble Space Telescope Servicing Mission Costs

The cost of servicing the Hubble has varied slightly from mission to mission depending on the compliment of both the replacement hardware and the science instruments. There have been four servicing missions—three enabling science and one “emergency” mission focusing only on the health and safety of the telescope. (Table 1)

In real year dollars, the average cost of servicing HST (less instruments and launch vehicle costs) is \$211 million per mission. Facility class science instruments such as the Advanced Camera for Surveys, Wide Field Camera 3 and the Cosmic Origins Spectrograph average approximately \$75 million per instrument. Productivity is maximized when two science instruments are amortized over the cost of an individual mission with the science investment accounting for 40 to 55% of the mission cost. (Table 2)

Although the cost of servicing fluctuates from mission to mission, the overall trend is downward. Over time, process improvements, combined with a more experienced workforce, have allowed the HST team to do more for less. Servicing-related manpower is down approximately 35% from the SM1 levels, and about 30% lower than the SM2 levels. At the same time, today’s more powerful science instruments, such as COS and WFC3, were produced at about 60% of the cost of the NICMOS and STIS instruments flown on SM2. In fact, SM1 total mission costs in FY 2003 dollars would be \$ 550 million. SM2 total mission costs would be \$599 million compared to the \$400 million projected for SM4.

Table 1

Servicing Mission 1 1993		Servicing Mission 2 1997	
Corrective Optics Wide Field Planetary Camera 2 (WFC2) Computer Enhancements Solar Array 2 Magnetometers Rate Sensor Units Solar Array Drive Electronics 2 GHRs Repair Kit		Near Infrared Camera Multi-Object Spectrometer (NICMOS) Space Telescope Imaging Spectrograph (STIS) Data Interface Unit Engineering/Science Tape Recorder Fine Guidance Sensor Optical Control Electronics Enhancement Kit Reaction Wheel Assembly Solar Array Drive Electronics #1 (Refurbished) Solid State Recorder	
Servicing Mission 3A 1999	Servicing Mission 3B 2001	Servicing Mission 4 Scheduled for 2005	
Advanced Computer Fine Guidance Sensor Multi-layer Insulation Rate Sensor Units S-band Single Access Transmitter Solid State Recorder Voltage/Temperature Improvement Kits	Advanced Camera for Surveys (ACS) Multi-Layer Insulation Repair Solar Array 3 NICMOS Cryocooler Power Control Unit Reaction Wheel Assembly	Wide Field Camera 3 (WFC3) Cosmic Origins Spectrograph Fine Guidance Sensor Rate Sensor Units Aft Shroud Cooling System Batteries Multi-Layer Insulation Repair	

Table 2

	SM1	SM2	SM3A/B	SM4
Science Enabling	165 ⁽¹⁾	274 ⁽²⁾	171 ⁽³⁾	192 ⁽⁴⁾
Servicing				
-Replacement Hardware	27	39	43	14
-Shuttle Carriers	55	43	51	40
-Operations Support	31	27	46	25
-Engineering ⁽⁵⁾	135	114	236	129
Total Servicing Cost	248	223	376	208
TOTAL MISSION	413	497	547	400
(less launch vehicle)				

(1) Includes Wide Field Planetary Camera 2 and corrective optics

(2) Includes STIS and NICMOS

(3) Includes ACS and NICMOS Cooling System

(4) Includes COS and WFC3 (estimated costs)

(5) Includes: Safety and quality assurance; systems engineering and verification; mission planning and analysis; astronaut training, crew aids and servicing tools; mission simulations, flight hardware mission integration and test; Shuttle/payload analytical and physical integration; and processing at Kennedy Space Center.

(6) Combined cost for Missions 3A, 3B plus tech demonstration flight